

CLAIMS:

1. An article inspection apparatus including:  
  
conveying means for conveying an article through an inspection site and rotating the article about an axis of rotation as it passes through the inspection site;  
  
an imaging system including a first and a second image capture means and a mirror arrangement that defines the field of view of said first and second image capture means, the imaging system arranged so that the first image capture means has a field of view including a top view and a first upper side view of an article on said conveying means and the second image capture means has a field of view including a top view and second upper side view of said article, wherein said second upper side view opposes said first upper side view.
2. The article inspection apparatus of claim 1, wherein the first and second image capture means are spaced apart along the direction of travel of the conveying means.
3. The article inspection apparatus of claim 2, including processing means to analyse images received from the first and second image capture means, the processing means analysing segments of the top view of the article from images captured at different stages of rotation of the article, the segments having dimensions so as to substantially avoid any overlap between segments.
4. The article inspection apparatus of claim 3, wherein the field of view of the first image capture means overlaps with the field of view of the second image capture means along the conveying means to an extent sufficient to enable the processing means to identify in the view of the second image capture means the last segment analysed from the first image capture means, and in this way identify an appropriate first segment to analyse from images from the second image capture means so that a substantially continuous picture of the surface of the article results by combining analysed segments from the first and second image capture means.

5. The article inspection apparatus of claim 4, wherein the extent of overlap is substantially the minimum to maintain said continuous picture of the surface of the article.
6. The article inspection apparatus of claim 4 or claim 5, wherein the processing means alters the dimensions of either or both of the last segment from the first image capture means and the first segment from the second image capture means in order to maintain said continuous picture of the surface of the article.
7. The article inspection apparatus of any one of claims 1 to 6, including processing means operable to receive plural images from said first and second image capture means and from said plural images identify a marking on the article, wherein the processing means then selects an image of said marking for analysis purposes according to predetermined criteria.
8. The article inspection apparatus of any one of claims 1 to 7, wherein the conveying means rotates the article at a speed so that it completes at least one complete revolution, but less than two complete revolutions while within combined fields of view of the first and second image capture means.
9. The article inspection apparatus of any one of the preceding claims, wherein the first and second upper side views are centred substantially at 45 degrees relative to the axis of rotation.
10. The article inspection apparatus of any one of the preceding claims, wherein each image capture means receives light via a first and a second optical path, and wherein:
  - the first optical path includes a single reflecting element that receives light from one of said upper side views and directs light received to the image capture means; and
  - the second optical path includes a first and a second reflecting element, the first reflecting element positioned to receive light from said top view and direct it to the second reflecting element, which redirects the light received to the image capture

means, wherein the second reflecting element is located substantially immediately adjacent to said first optical path.

11. The article inspection apparatus of claim 10, wherein the image capture means has its optical axis centred on a line that bisects said first and second optical paths.

12. The article inspection apparatus of claim 10 or claim 11 wherein the first and second optical paths have substantially equal path length.

13. The article inspection apparatus as claimed in any one of the preceding claims, wherein said conveying means includes two or more lanes for conveying articles past said imaging system and wherein the apparatus includes processing means operable to distinguish in images taken by said first and second image capture means articles in each lane.

14. An article inspection apparatus including two or more article inspection apparatus as claimed in any one of the preceding claims located side by side with the respective first and second image capture means of each article inspection apparatus substantially in line with each other.

15. The article inspection apparatus of claim 14 including light sources arranged along both sides of each conveying means equidistant from the conveying means, with the light sources between said conveying means located substantially on a vertical plane that intersects the mid-point between the conveying means.

16. The article inspection apparatus of claim 15, wherein said light sources include at least one light source on a first side of a first conveying means located at a height so as to have a clear line of sight to articles on a second conveying means adjacent to the first conveying means on the opposite side from said first side.

17. The article inspection apparatus of claim 15 or claim 16 wherein said one or more light sources include at least one light source located approximately in a horizontal plane from articles when located on said conveying means.

18. The article inspection apparatus of claim 17 wherein the at least one light source located approximately in a horizontal plane from articles includes a light source above the equator of the article and a light source below the equator of the article.
19. The article inspection apparatus of any one of claims 15 to 18, wherein the light sources are positioned to provide substantially uniform lighting over a spherical surface commensurate with the expected size of articles to be inspected.
20. The article inspection apparatus of any one of claims 15 to 19 wherein said one or more lighting sources are fluorescent tubes extending parallel to the conveying means.
21. A method of article inspection including:
- conveying an article through an inspection site and rotating the article about an axis as it passes through the inspection site;
  - using a first image capture device, viewing a top view and a first upper side view of an article as it passes through the inspection site;
  - using a second image capture device, viewing a top view and a second upper side view of an article as it passes through the inspection site, the second upper side view opposing said first upper side view.
22. The method of claim 21 including dividing the total area viewed by each of the first and second image capture devices between said top view and upper side view dependent on the shape of articles to be inspected.
23. The method of claim 22 including viewing less of the upper side view and more of the top view for ellipsoidal shaped objects.
24. The method of any one of claims 21 to 23 including analysing segments of images from said first and second image capture devices, the segments collectively defining the entire top view of the article as it passes through the inspection site substantially without overlap or omission of portions of the surface of the article.

25. An article inspection apparatus substantially as herein described with reference to Figure 1 together with Figures 2 and 3, or Figure 4, or Figure 5 of the accompanying drawings.
26. A method of article inspection substantially as herein described with reference to Figure 1 together with Figures 2 and 3, or Figure 4, or Figure 5 of the accompanying drawings.